"FRONTIER TO FREEWAY"

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British Columbia transportation in the early days was a story of men with a purpose pushing through heavy forest, climbing sheer canyon walls, and finding hidden passages through impassable mountain ranges.

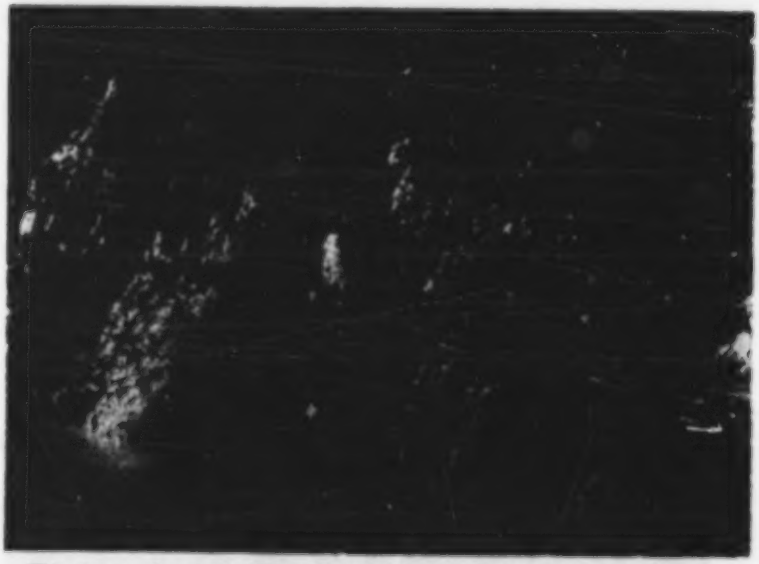
Fighting cold, loneliness, bleak wilderness, and even one another, they blazed trails to gold fields and fertile valleys. These trails are today the highways which span the wide interior plains of British Columbia, climb the mountains, and skirt the inland waterways.

In many parts of the Province a century ago, the Indians were the original trail builders and they were followed by explorers and fur traders from the Hudson's Bay Company and the North West Fur Trading Company. In other parts the mad dash for gold made road-building an urgent necessity which overcame the many obstacles.

One of the most famous of the early roads was the *Cariboo Highway* built by the Royal Engineers, which today follows the same route as the 20-mule-team freight wagons followed 100 years ago.

Historian Judge Howay described it in these words:

"Reaching from Yale, the head of navigation, to the mines of the Cariboo, a distance of nearly 400 miles, and solidly and substantially constructed by our infant colony in less than three years, this road was the pride of British Columbia, and a source of wonder and admiration to its visitors, who were loud in their expressions of surprise at the daring conception and skillful execution of the work . . ."



This picture taken in the 1860's shows the Cariboo Road in the Fraser Canyon.

The Seven Phases of Development

The physical development of the road system of British Columbia can be classed into seven different phases. These are:

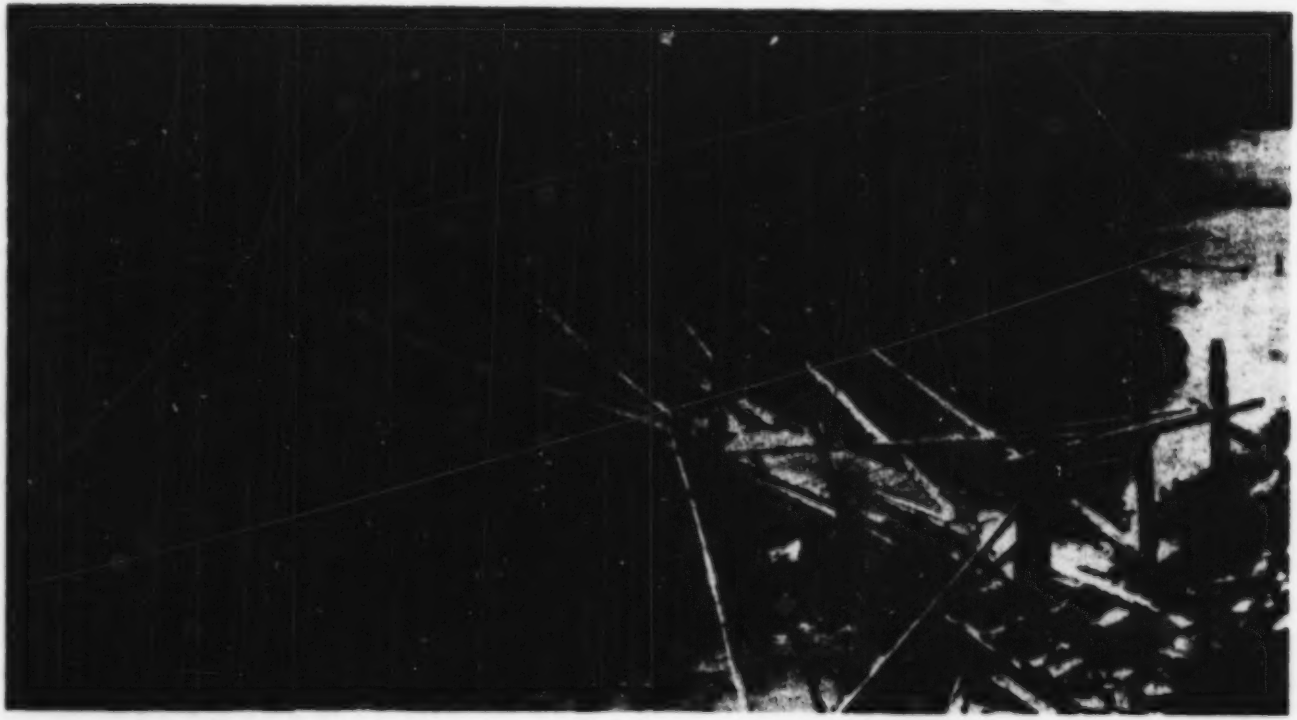
(1) Indian trade routes.
(2) Fur trails.
(3) Gold trails.
(4) Wagon roads.
(5) Trunk roads.
(6) Modern engineered highways.
(7) Multilane highways.

The seven phases overlap in time but each is distinct and a response to the different social factors and challenges.

Indian Trails

In many parts of the Province a century ago, the Indians were the original trail builders and the all too common conception of the primitive indolent Indian picking berries or sitting by a stream waiting for salmon is a fallacy. The fact is, life for these neolithic food gatherers was full of toil and their social system and culture was quite sophisticated. An important part of this was their trade because not all staples necessary for their way of life were available locally. Salt for the interior Indians for instance, came from the coast, while obsidian for arrow and spearheads, came from Mount Waddington.

Many of the trails used required structures in certain areas, such as a simple log felled to cross a creek. Others were more elaborate composite timber structures including stairways and dry bridges. The most elaborate probably was the famed Hagwilget Bridge over the Bulkley River at Hazelton in northern British Columbia. This bridge, constructed of wood poles tied together by telegraph wire, supported a 1.8-metre (6-foot) wide pathway across a span of 45.7 metres (150 feet), joining cliffs some 30.5 metres (100 feet) above the river. For nearly 50 years it carried a stream of hunters, prospectors, traders, explorers, and settlers beyond the deep canyon.



Hagwilget Bridge over the Bulkley Canyon is the earliest known bridge of any size in British Columbia.

The Indians' success here was made possible partly by a white man's failure. The venture of an engineer named Colonel Bulkley, commissioned to build an overland telegraph line to Europe, via the United States, British Columbia, the Aleutians and Siberia was dropped when others succeeded in laying the first Atlantic cable. The miles of telegraph wire dumped and abandoned by Bulkley in the Hazelton area was used by the Indians of Hagwilget to tie poles together when they built the famous bridge.

Fur Trails

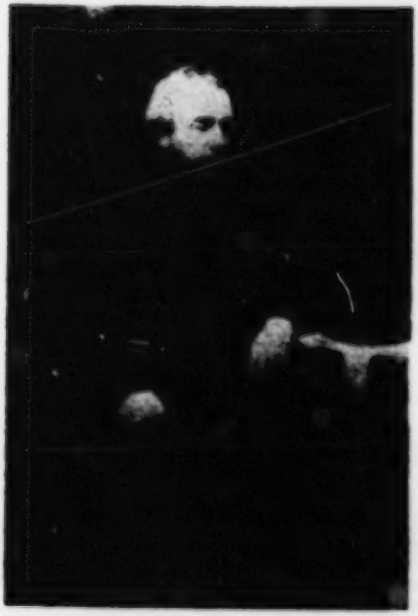
The second phase begins with the arrival of the land-based fur traders in 1805. These fur or "brigade" trails as they were sometimes known, were used by traders to bring in supplies and pack out furs, west to the sea, or east to the Northwest Territories. Some of the trails used were the existing Indian paths and some were new trails along routes seldom used by Indians. Water routes also played a part. On land the fur traders cleared trees and brush but did little by way of bridge construction.

Gold Trails

Settlement in British Columbia was sparse until the 1840's. Europeans had visited the coast regularly since Captain Cook's arrival in 1778, and there had been intermittent settlement at Nootka since 1788, but it wasn't until 1805 that land-based traders first began to settle permanently at Fort Nelson and Fort McLeod. Government at the time was administered by the Hudson's Bay Company. In 1850, Richard Blanshard was appointed governor but left the colony a year later after he found that the traditional authority of the Hudson's Bay Company was stronger than his own as governor. James Douglas, a veteran employee of the Company, succeeded Blanshard. Early expenditures were on trails and roads in the vicinity of Victoria, largely to serve the farming settlement. The mainland was still largely fur country but by this time coal was being mined at Nanaimo and the Thompson River Indians were mining gold in small quantities. Word soon spread, however, and by 1857 miners began pouring into the Fraser Canyon country. Taking to heart the lessons learned from the loss of the Columbia River country to the United States, Governor Douglas concluded that positive steps were necessary to preserve the mainland for the British Crown. One such step was to develop adequate trails north of the 49th parallel to provide greater accessibility to the mining areas than the American routes. The first such trails, constructed largely between 1858 and 1861 were from Spuzzum to Yale (the head of navigation on the Fraser), Hope to Similkameen (towards the Rock Creek goldfields) and Harrison to Lillooet (for the Cariboo and Thompson River).

Edgar Dewdney

Edgar Dewdney was a major road-builder in the Colony of British Columbia. In 1872 he was elected to the House of Commons from the Yale Riding; in 1879 he was the Indian Commissioner for the Northwest Territories; the Lieutenant-Governor and Commissioner of the Territories in 1881; and the Dominion representative for East Assiniboia (Manitoba) from 1888 to 1892. He finished his life in Victoria as a mining broker after a period as the Lieutenant-Governor of British Columbia which lasted from 1892 to 1897.



Richard Clement Moody was the first Chief Commissioner of Lands and Works in the Colony of British Columbia and Lieutenant-Governor from 1858–1863. He was also a Colonel in the Royal Engineers. Following his service in British Columbia, he returned to England and was promoted to the rank of Major General in 1866. He died on March 31, 1877. (Provincial Archives, Victoria, B.C.)

The Royal Engineers. 1858–1863

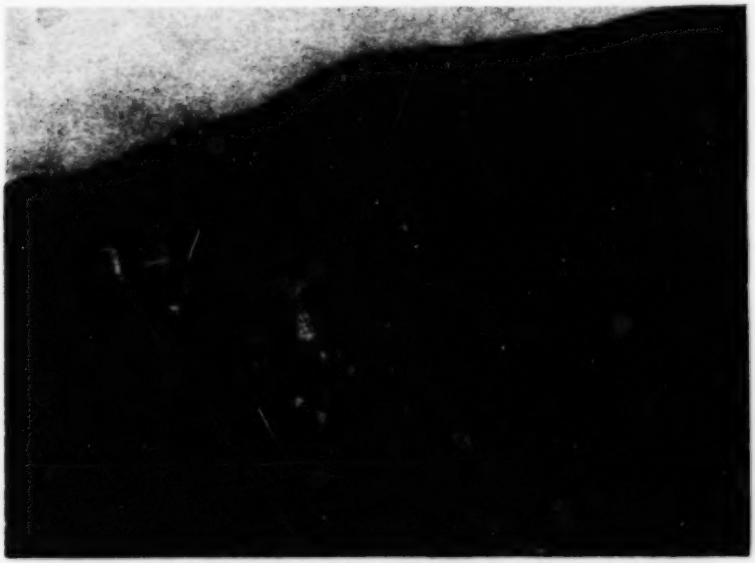
A sergeant and two sappers: dress for the officer was a scarlet tunic with dark blue trousers and a scarlet stripe along the seams; yellow cord on the shoulder straps, collar, and sleeve cuffs; blue collar and cuffs; blue pill-box hat with a yellow band and red piping; a buff white belt. The sappers wore grey shirts with their uniform.

On October 29, 1858, Secretary of State Lytton instructed Colonel Moody "to regard with a military eye the best position for such towns and cities as for the engineering of roads and passes or laying the foundation of any public works . . . All that belongs to comprehensive survey and public works must belong to the labour of the Royal Engineers."

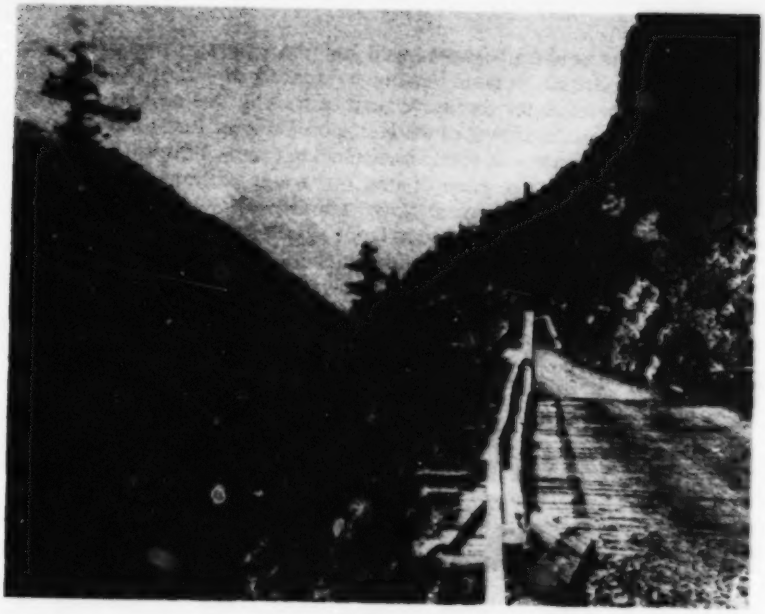
The sappers received a mixed allowance for their work on the Harrison to Lillooet road in 1859 — 10 per cent in cash, 10 per cent in rations valued at $1 per day, 80 per cent in rural land around Queensborough (New Westminster), and free passage from that city to Port Douglas on the northeast end of Harrison Lake.

Wagon Roads

While the gold trails served well and played a large part in keeping the mainland British, it soon became evident to Governor Douglas that they were expensive for the movement of freight. A start was made on improving the land sections of the Harrison-Lillooet Trail to wagon road calibre, but the route was soon abandoned because of the cost of double handling the freight for each of the four water sections and the short horse-drawn railway at Seton Portage. The Governor's next decision was to develop the Cariboo wagon road from Yale. The work took three years and a road 5.5 metres (18 feet) wide and adequate for two teams to pass was completed to Barkerville. Other wagon roads followed, notably North Road from New Westminster to Port Moody (built by Royal Engineers) and in 1861 for the first 49 km (25 miles) from Hope to Skagit. This last part was the first and last section of a wagon road to the Rock Creek goldfields. The need for this section passed, however, as the Rock Creek rush petered out and the miners headed for the Cariboo. In 1866 another wagon road was build from Cache Creek to Savona to provide access to the Columbia River goldfields above Revelstoke. While the emphasis was on roads to gold mines until about 1870, the first wagon road was in fact Craigflower Road in Victoria, built in 1854 to connect agricultural areas.



Freighting on the Cariboo Road around 1870. Wagon road was built by Royal Engineers partly through the rugged Fraser and Thompson canyons.



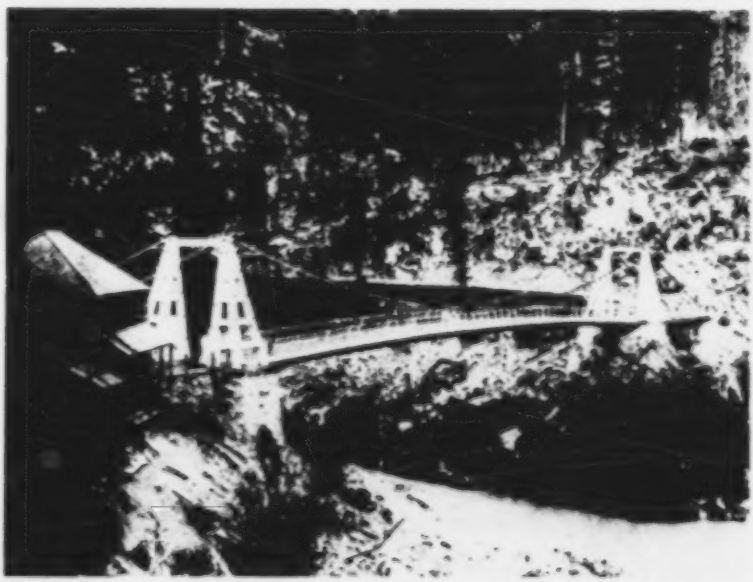
Two shots of the Cariboo Road in the Fraser Canyon built by the Royal Engineers in the 1860's.

Trunk Roads

For some time it had been recognized and confirmed, by the depression of 1866, that furs and gold were not an adequate base of prosperity. Also, it was felt that the work of the previous two decades had been in response to specific needs and had not produced a coherent network that would assist the Province in general development, particularly agricultural settlement. In 1873, the Province of British Columbia, under Chief Commissioner of Works, Robert Beaven, embarked on a new policy to encourage agricultural settlement and logging. The development of Trunk roads was considered an essential element of this policy. Revenues were low in relation to the tremendous cost of the great distances in the Province and the Trunk network took many decades to come to full fruition and indeed could be said to be incomplete even today. In addition to low revenues, the coming of the railroads had a major influence in retarding the development of the Trunk road system. After the Cariboo Road, the first elements in the Trunk system were a road from Savona to Kelowna and another from New Westminster via Langley and Sumas to Hope. Soon after, there were roads from Victoria to Nanaimo, Kamloops to Nicola, O'Keefe to Enderby, and Nicola to Spence's Bridge. The good start made on the Trunk system was held in suspension from the 1880's when the Province was caught up by the railway fever. In fact the CPR destroyed portions of the Cariboo Road in the Fraser Canyon and the CNR in the 1910's destroyed more, and the Fraser Canyon section was not opened again until 1926.

Modern Highways

In the 1930's and 1940's a fair amount of paving had been done but it had not kept pace with demand and many long sections of major routes remained unpaved. Between 1939 and 1945 there was very little paving done. After 1945, increasing prosperity brought an explosive increase in automobile ownership and travel but the standards of much of the Trunk system were not adequate for the needs of these modern automobiles, buses, and trucks. Consequently, in the 1950's and 1960's a large program was embarked upon to upgrade alignment and pave the rural Trunk system. Canada participated financially in the Trans-Canada Highway and some northern roads, but the assistance was very small compared with expenditure from Provincial revenue.



Bridges were an important feature of early wagon roads including this elaborate truss over the Thompson River and this early 1863 suspension bridge, the first of three Alexandra Bridges over the Fraser River, about 22.5 kilometres north of Yale. It was replaced in 1926 by a newer suspension bridge and the present steel arch span was completed in 1962.

Switchback motor road on the way to Yoho Valley, Yoho National Park, 1920's.
(Provincial Archives, Victoria, B.C.)

Motoring on the Malahat near Victoria in 1918.
(Provincial Archives, Victoria, B.C.)

Rogers Pass on Highway 1, the Tuppers in Glacier National Park.

Mathews Road Interchange, Deas Island Throughway.

Multilane Highways

In the 1950's when traffic volume began taxing the capacity of the Province's two-lane urban system, the multilane phase began and overlapped the continuing development of the "modern highways" in less heavily travelled parts of the Province. Multilaning first commenced in the Vancouver area with the Burnaby and Vancouver/Blaine freeways and associated major structures such as Second Narrows, Port Mann, and Oak Street Bridges and the Massey (Fraser River) Tunnel. Other more conventional facilities such as the Lougheed Highway and Southwest Marine Drive were also multilaned. Some of the cities, especially Vancouver and Victoria, had multilane streets for some time. Currently, several rural highways are being multilaned including parts of the Trans-Canada, Island, Lougheed, and Okanagan Highways. Because of increasing traffic, it is expected that this phase will continue for some time.

Expenditures

The first appropriation was $500 in 1854. By 1954 the appropriation had risen to $36,000,000 and by 1984 it was $570,000,000. The revenue was derived from several sources. The first appropriation was raised mostly by a tax on liquor, but this was inadequate for the heavy expenditures in the wagon road phase and later phases. Bond issues and tolls paid for the Cariboo Road and the tolls remained in place for many years. Some of the tolls were collected directly by the contractors building particular sections of road. From 1860 to 1866, statute labour was required although the original English law had been repealed many years before. Under this system, settlers had to work six days a year on road work for no pay or pay an indemnity of 6s 3d per day. The unpopular measure was repealed in 1866 and replaced with a road tax of $2 per year from each resident male and non-resident property owner. Arrears were charged 18 per cent interest. Tolls were again revived in the 1950's to assist in constructing large, expensive bridges and tunnels, but were removed later in the 1960's. Since the early 1950's highways expenditures have come from general revenue. However, the new Coquihalla Highway will have tolls for both passenger and commercial vehicles.

The Ministry

With the first appropriation in 1854 there were three Road Commissioners appointed to oversee the expenditure. In 1858 the first Department was created, which became the Department of Lands and Works under the Chief Commissioner of Lands and Works. The Ministry remained associated with Lands until 1908 when a separate Department of Public Works was formed and placed under a Minister of Public Works in 1954, "Highways" was split off from Public Works into a Department of Highways under a Minister of Highways. In 1977, most of Public Works became a Crown corporation and the Safety Engineering Services Division rejoined Highways to form the Ministry of Highways and Public Works. On December 5, 1978, Transportation and

Communications were added to the portfolio and the title became the Ministry of Transportation, Communications and Highways. In November, 1979 Communications was moved to another portfolio and the Ministry assumed its present title.

The roster of Chief Commissioners and Ministers is a distinguished one (photographs at the back of the book):

1858–1863	Col. R. C. Moody	1907–1908	F. J. Fulton
1863	C. Brew	1908–1914	T. Taylor
1864–1871	J. W. Trutch	1914–1915	C. E. Tisdall
1871	B. W. Pearse	1915–1921	J. H. King
1871	H. Holbrook	1921–1927	W. H. Sutherland
1872	G. A. Walkem	1927–1929	N. S. Lougheed
1872–1876	R. Beaven	1929–1932	R. W. Bruhn
1876–1878	F. G. Vernon	1932–1933	R. H. Pooley
1878–1882	G. A. Walkem (also Premier)	1933–1939	R. M. MacPherson
1882	R. Beaven (also Premier)	1939–1941	C. S. Leary
1883–1887	W. Smithe (also Premier)	1941–1945	H. Anscomb
1887–1895	F. G. Vernon	1945–1952	E. C. Carson
1895–1898	G. B. Martin	1952–1968	P. A. Gaglardi
1898	C. A. Semlin (also Premier)	1968	W. A. C. Bennett (also Premier)
1899	F. L. Carter-Cotton	1968–1972	W. D. Black
1900	J. S. Yates	1972–1973	R. M. Strachan
1900–1903	W. C. Wells	1973–1975	G. R. Lea
1903	R. McBride (also Premier)	1975–	A. V. Fraser
1903–1906	R. F. Green		
1906	R. G. Tatlow		

Ferries were, of course, the cheapest and simplest method of crossing British Columbia's thousands of water barriers in the early days and some 60 are still in operation today on 47 routes. Yale had a ferry in 1859, a makeshift barge hauled by hemp cable strung between two trees on opposite banks of the Fraser River. In 1858, a ferry operated across the Fraser farther north where *Alexandra Bridge* now stands. Another ferry across the Thompson River was discontinued when Spences Bridge was built in 1864.

There were no schedules, of course, and travellers sometimes had to wait a whole day for the ferryman to return from a hunting-trip before they could obtain passage.

The broad mouth of the Fraser River, where the *Pattullo Bridge* now stands, was originally crossed by a ferry called the *K de K*, which began operation in 1884. Rates were 25 cents for an individual, 50 cents for a person on horseback and $1.75 for a wagon and team.

The "reaction" ferry was another ingenious method devised for crossing swifter rivers. A permanent cable running over the river held the vessel against the current while it tacked like a sailboat from bank to bank. Some of these are still in use today in remoter parts of the Province.

This tug and barge ferry operated on François Lake between 1914 and 1920.

Big Bar reaction ferry on the Fraser River in 1920. Over the years the basic design of this type of ferry has not changed and there are still six in use throughout the Province.

Famed North Bend aerial ferry over the Fraser River, joining the communities of Boston Bar and North Bend, about 64 km east of Hope on Highway 1. In the 45 years it operated it carried 2,037,579 vehicles and 6,092,434 passengers and drivers and it made 1,610,789 round trips.

Accidental destruction of one of these ferries at Big Bar, 40 miles north of Lillooet, led to the first aerial ferry. A Cariboo rancher named Shorty Schrader hooked a sort of bosun's chair to the still intact cable and pulled himself across with his arms. This was used for two years.

This may have led to the design many years later of the famous *North Bend aerial ferry* still in use today, but soon to be replaced by a new bridge. Capable of carrying one car or 40 passengers, the cable car runs 25 metres above the river on two 4.4 cm steel cables. It is the only one of its kind in Canada and in 1984 it carried an amazing 96,271 vehicles between Boston Bar and North Bend.

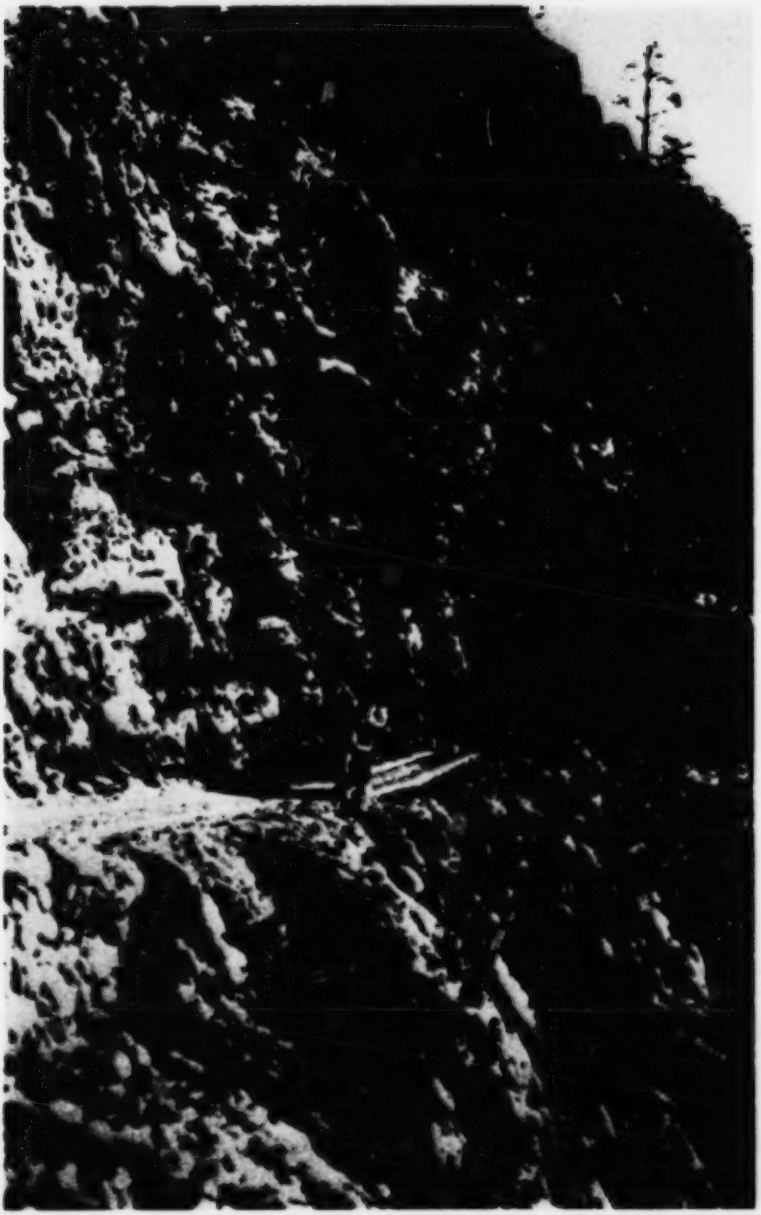
The first ferry across Okanagan Lake from Kelowna to Westbank (where a new floating bridge was built in 1958) was a scow propelled by oars and capable of carrying three heavy horses or five pack horses.

Many famous old stern-wheelers, similar to the famous Mississippi River boats in the southern United States, plied the lakes in British Columbia. One such vessel now serves as a landlocked historical oddity and restaurant at Penticton.

Building of roads in various parts of the Province proceeded slowly during the early part of the 20th century and there was no cohesive system. It was impossible to cross the Province by road, and the only route into the central and northern interior was the Cariboo Road, very much in the same form in the 1920's as it was in the 1860's.

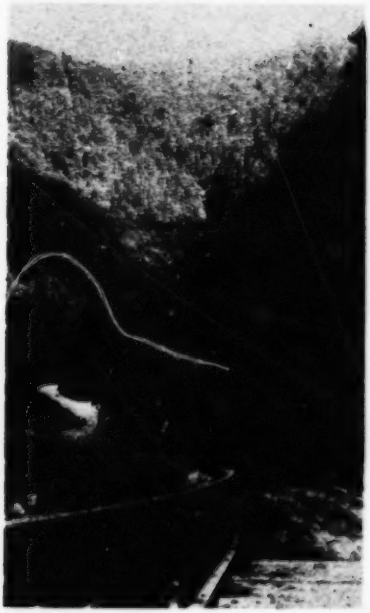
As in most parts of North America, the 1920's could be called the real start of the automobile age. In 1920 there were 28,000 motor vehicles registered in British Columbia and by 1925 this had grown to 56,427. The total reached 98,938 in 1930 and there it stayed until 1935 when the depression curtailed automobile buying. By 1940 it had inched up to 128,000, but then until 1945, the Second World War held the total to 135,000. By 1950 there were 270,000 vehicles and by 1959 a total of 541,363. It was not until after the Second World War that any attempt was made to bring the various isolated parts of British Columbia together by road.

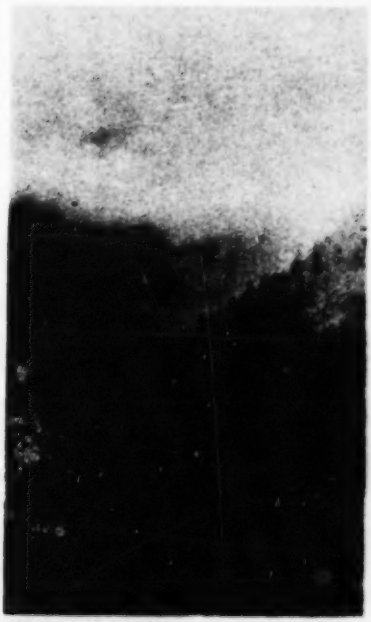
Thus started a modern age of highway building to match the phenomenal growth of the Province's economy, its population, and its motor vehicle registration.



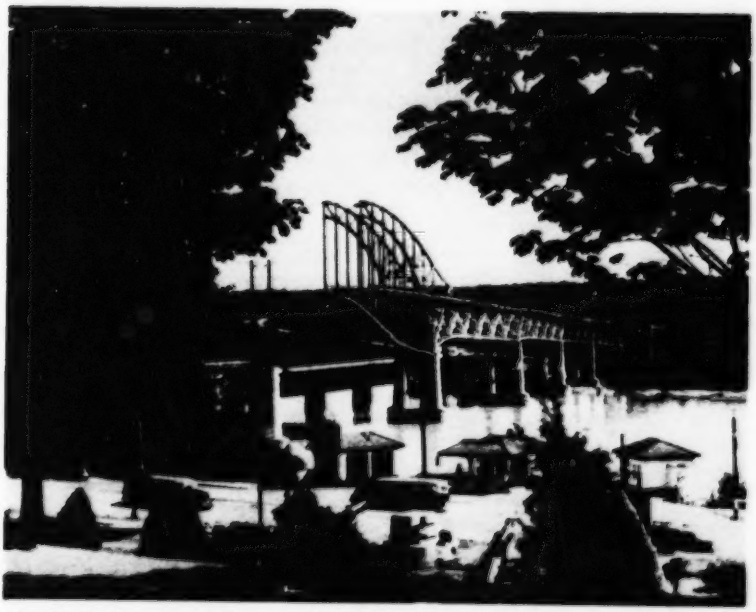
Rock cut between Lytton and Lillooet on the Cariboo Road. Picture was taken in mid-1920's when the road was unchanged from the wagon road built in 1863 by the Royal Engineers.

Two shots of the Malahat Drive 10 kilometres north of Victoria around 1918. Note right-hand drive car. B.C. drove on the left side of the road before 1920.

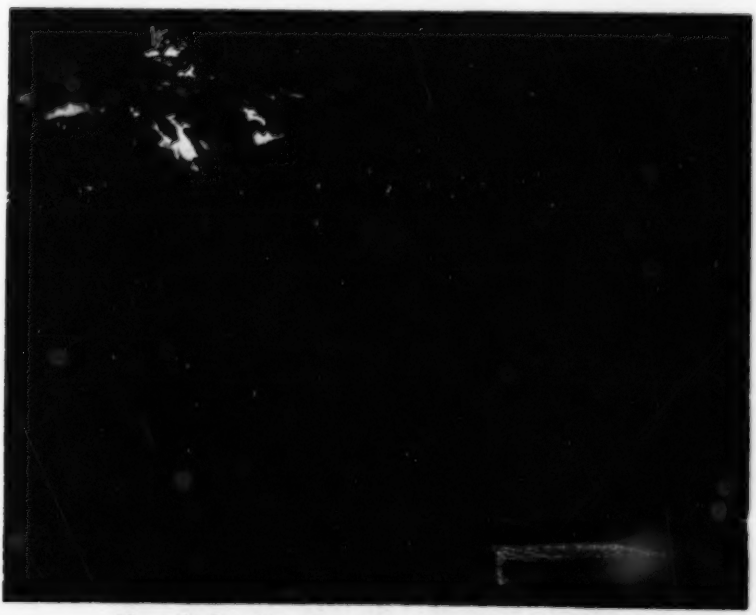




Three pictures of the "improved" Fraser Canyon highway in the 1920's. Fourth picture (bottom right) shows the same road unchanged in the early 1930's.



Pattullo Bridge over the Fraser at New Westminster under construction around 1933.



Mount Sir Donald in Rogers Pass, Trans-Canada Highway.

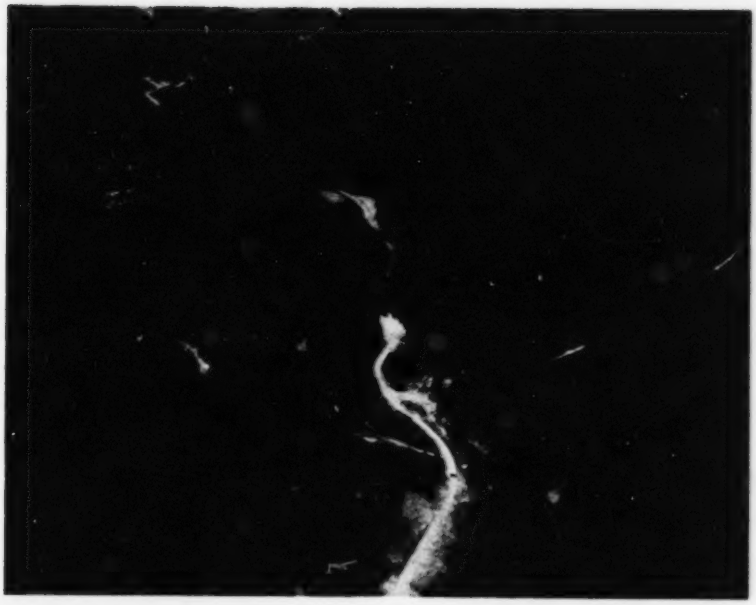
In the past 32 years the population of British Columbia rose from 1,342,000 to 2,870,700 (1984), an increase of 108 per cent. But in the same period the passenger motor vehicle registrations went from 405,000 to 1,838,995 in 1984, an increase of 302 per cent. This is reflected in the ratio of population to vehicles 1.24 persons per vehicle, including commercial units. The comparable figure in 1955 was 3.2. British Columbia has consistently had the highest ratio of cars to people in Canada. Needless to say, traffic counts on some of the Province's major highway facilities have increased proportionally, particularly in the urban areas. A random choice shows that the average daily summer traffic on the *Trans-Canada Highway* at the *Second Narrows Bridge* in Vancouver was 36,000 in 1965, 58,000 in 1970 and 86,426 in 1984. Just east of Taylor Way it was 10,000 in 1960, 19,000 in 1970 and 39,100 in 1984.

Total distance of roads in British Columbia under the jurisdiction of the Ministry of Transportation and Highways in 1984 was 43 843 kilometres. Of this total, 18 919 km are paved and 24 924 km are gravel. There are another 12 000 km of roads within organized municipalities and cities not under the jurisdiction of the British Columbia Ministry of Transportation and Highways. In 1946 the entire British Columbia provincial budget for all ministries was $37,000,000. In 1983-84 the budget just for construction and maintenance of roads, bridges and ferries was 14½ times that amount. The phenomenal increase in industry activity, population, and motor vehicle registration in the years since World War II has made highway construction and maintenance a huge undertaking.

Construction of the *John Hart Highway,* a fairly low-standard gravel road, joined Prince George to the Peace River area by about 1950. The *Hope-Princeton Highway,* completed about the same time, was the first modern highway to be built into the interior from the coast.

The Ministry of Transportation and Highways in 30 years has constructed and reconstructed about 17 600 km of Provincial highway. About 4 350 km of this to a high standard by contract (317 km of which were multilaned, divided freeway design), and the rest, 13 394 km by day labour consisting of construction or major improvements to various standards. During the same period it has also paved and resurfaced 17 654 km of highway by contract with plantmix and 7 840 km with sealcoat surface protection.

One of the most important early events in this period was the completion and opening of the new *Rogers Pass* section of *Highway 1* between Revelstoke and Golden, built under the Trans-Canada Highway Agreement on a cost-sharing arrangement with the federal government. This 147 km section of highway cost $50,000,000 in all and opened up some of the most beautiful and spectacular mountain country on the continent. Apart from the tourist aspect, the new route cut about 160 km and seven hours of travelling time off the old *Big Bend* loop. When the new highway was opened on July 30, 1962, traffic counts immediately increased tenfold over those of the old ones. Traffic counts have continued to increase since that time.

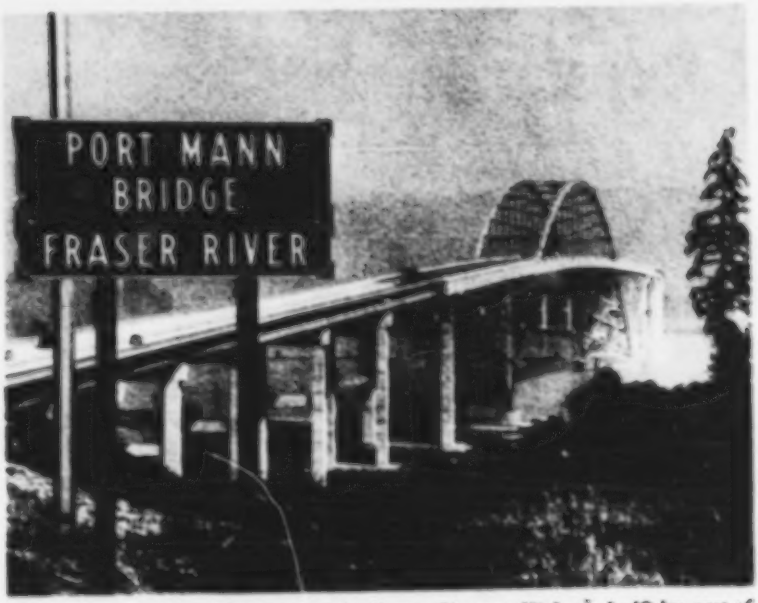


Two views of Highway 1 *in Rogers Pass. Above, spectacular aerial shot shows Lanark snowshed and, below, section along the Illecillewaet River.*

Typical of difficult construction Highway 1 in the Fraser Canyon, Yale Tunnel and Saddle Rock Tunnel further north.

Anderson River Bridge.

Rock cut, Fraser Canyon.



Spectacular Port Mann Bridge over the Fraser River on Highway 1, 19 km east of Vancouver. Giant structure is 2 104 metres long overall and 44 metres above high water.

Highway 1 near Vancouver city centre.

The first phase of the long and extremely difficult work on the *Fraser Canyon* section of *Highway 1* was completed in the late 1960's. The two most recent tunnels through rock bluffs were opened to traffic in 1966. A major rock scaling project was carried out in 1974 and 1975 at Hells Gate and further improvements and construction of additional lanes has continued since that time. There are seven tunnels in all, ranging in length from 91 metres to 640.5 metres.

The new *Alexandra Bridge* over the Fraser River, opened in 1962, was even more significant in that the 35,000-pound load limit was eliminated, allowing trucking to travel at legal loads through this section of *Highway 1*. Some of the most difficult and expensive highway construction work in Canada was encountered in this spectacular Fraser Canyon gorge, the same general route used by the Royal Engineers to build the *Cariboo Highway* more than 100 years ago.

However, a new and even more ambitious route is now being built into the interior from Hope through the Coquihalla Pass. This new highway was started in 1979 and work proceeded slowly until 1984 when the government made a major announcement undertaking to complete the first phase of the huge construction job as far as Merritt by 1986. Cost of the finished four-lane highway right through to Kamloops will be $375,000,000. The first section from Hope to Merritt involves some 114 kilometres of heavy construction through a mountain pass and hill country. The second section between Merritt and Kamloops is expected to be completed in 1987.

The year 1964 saw another important event in British Columbia's highway development in the opening of the new *Port Mann Bridge* and remaining sections of *Highway 1* (then called Route 401) in the Lower Mainland. The total length of the sections officially opened June 12, 1964, from the *Second Narrows Bridge* to Mount Lehman Interchange and "C" Street Interchange to the Vedder River was 75 kilometres, with 89 kilometres of interchange connections and frontage roads. It was built at a cost of some $77,000,000 in 1964 dollars. There were 63 separate contracts in this section, involving 40 prime contractors. The three sections — Taylor Way to Second Narrows Bridge, Mount Lehman to "C" Street, and Vedder River to Agassiz Junction — were opened earlier. The total length from Taylor Way to Agassiz Junction, including these sections, is 121 kilometres plus 105 kilometres of interchange connections and frontage roads. The total cost of the whole 121 kilometres was about $125,000,000. Seventy-two kilometres are full freeway design and about 49 kilometres expressway. The latter section is now being upgraded to freeway standard by the progressive elimination of grade intersections and construction of new interchanges. Since 1971 the 13-kilometre section from Horseshoe Bay to Taylor Way has been completely upgraded to a full freeway standard at a cost of $32,000,000. Work is currently underway to upgrade to four lanes the 37 kilometres from Agassiz Junction to Hope.

Other improvements to the Trans-Canada Highway were carried out through the 1970's including a new four-lane section just north of Victoria, various new four-lane sections on Vancouver Island between

Victoria and Nanaimo, reconstruction from Horseshoe Bay to Taylor Way in West Vancouver, additional lanes on various sections through the Fraser Canyon and east to Kamloops and completion of the Kamloops Bypass.

Another important completion in 1964 was the *Salmo-Creston* section of the Southern Trans-Provincial Highway. This 67-kilometre section of new highway attains the highest elevation of any arterial highway in Canada, an altitude of 1 768 metres. It is a "cut-off" in the truest sense and provides an alternative to the 160-kilometre route through Nelson and along Kootenay Lake.

At the same time a major reconstruction of *Highway 16* has also been under way for several years between Prince George and Prince Rupert. Of the total 728 kilometres, all has been paved and most reconstructed.

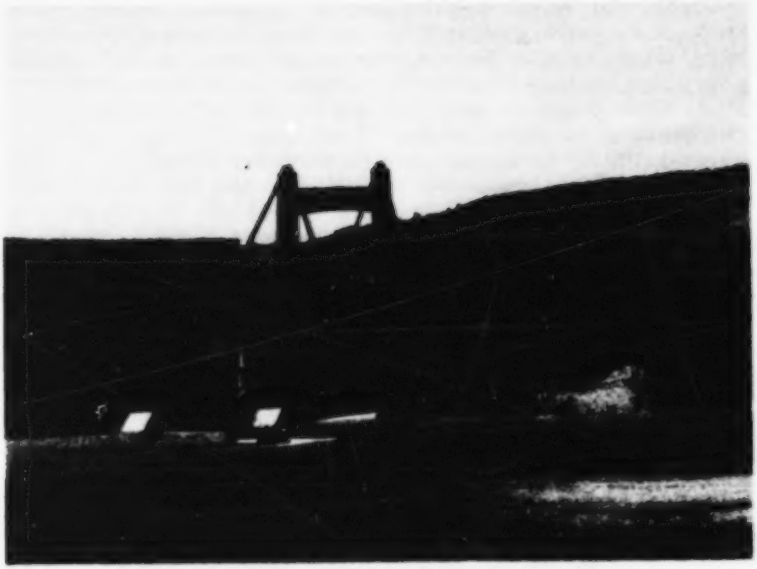
Under construction in 1985 is this section of the new Coquihalla route at the Coquihalla Lakes section some 55 kilometres northeast of Hope.

Hudson Hope-Chetwynd Highway en route to W. A. C. Bennett Dam on the Peace River.

Yellowhead South Highway 5 along North Thompson River near Valemount.

Section of Yellowhead Highway 16 between Hazelton and Moricetown. Highway runs 1 104 km from Prince Rupert to Alberta border.

Rugged mountain pass on Salmo-Creston section of Highway 3 which attains an altitude of 1 769 metres, highest in Canada for a main highway.



Peace River Bridge on Highway 29 near Hudson's Hope.

Rugged British Columbia coastline is seen in this view of the Squamish Highway along Howe Sound, with the B.C. Railway below. Cost for 34 km was $11,000,000 when it was built in the early 1960's.

Work was completed on two of British Columbia's largest highway projects for the 60's and early 70's — extension of *Highway 16* east from Prince George to McBride, with reconstruction to the Alberta boundary and reconstruction of *Highway 5* from Kamloops to Tête Jaune Cache. Many highway and bridge contracts were involved, covering a total distance of about 704 kilometres. Total cost of this work was about $97,000,000. Further upgrading on the portion of *Highway 5* just north of Kamloops is underway and late in 1984 a new $16,300,000 four-lane bridge over the North Thompson River was officially opened. The 450-metre structure provides a connection from North Kamloops to Highway 5.

Paving of the 409-kilometre *John Hart Highway* between Prince George and Dawson Creek was completed about 1976 after a program of reconstruction and paving during the previous 10 years. Further upgrading of substandard sections is under way. The Ministry also built a new road and bridge over the Peace River to connect Chetwynd and Hudson Hope, and rebuilt and paved the road from Hudson Hope to Fort St. John.

Also built and paved was a new access road from Squamish at the head of Howe Sound to Pemberton, a distance of about 91 kilometres. This is a medium standard road providing access to Garibaldi Park, Alta Lake, and other features of the valley. Further upgrading has been carried out in the 70's and 80's.

Another important function of the Ministry has been co-operation with British Columbia Hydro in the development of roads in hydro-electric projects. The 64-kilometre *Chetwynd-Hudson Hope Road* and the award-winning bridge over the Peace River are examples of this kind of work. Earlier the Ministry reconstructed, then paved, about 19 kilometres of new highway from Hudson Hope to the site of the W. A. C. Bennett Dam itself. It rebuilt the 136-kilometre western leg of the old *Big Bend Highway* to service the Mica Dam during construction and to provide access to the area for the public. The Ministry has since completed a $120,000,000 construction program to relocate large sections of this highway above reservoir levels after construction of a second storage dam downstream. Improvements were made to the *Kaslo-Lardeau Road* as part of the Duncan Lake hydro development.

In 1972, the link-up of the *Stewart-Watson Lake Highway* totalling 638 kilometres was completed. Designated Route 37, it continues south from Meziadin Lake to Kitwanga. A circuit can now be made via Highways 37, 97 and 16 to the point of commencement. Further upgrading and paving of this major alternative to the Alaska Highway has continued with a number of contracts under way south of Meziadin Lake and north of Dease Lake. Between 1975 and 1984 the Ministry spent $104,000,000 on improvements. Out of the total distance of 808 kilometres from Kitwanga to the Yukon Border, 446 kilometres or 55 per cent is now paved.

In June 1984 history was made when the $80,000,000 Liard Highway was officially opened. Running 400 kilometres from the Alaska Highway at Fort Nelson to the McKenzie Highway in the Northwest Territories near Fort Simpson, the huge project was a joint

federal/provincial undertaking. British Columbia built the 137-kilometre section from Fort Nelson to its northern border at a cost of $26,000,000 and the federal government built the 255 kilometres Northwest Territories section at a cost of $55,000,000.

On Vancouver Island, a new 50-kilometre section of the *Island Highway* between Campbell River and Kelsey Bay was completed in the mid-60's. Kelsey Bay was the original terminal of the Prince Rupert ferry route inaugurated by the B.C. Ferries in May 1966. In 1970 work began on a new 48.8-kilometre link to connect Kelsey Bay with the northern part of Vancouver Island via Woss Lake and the Nimpkish Valley to Port McNeill and Port Hardy. By 1978 this was completed together with a new ferry terminal at Bear Cove for the Prince Rupert service and a 3.2-kilometre connection road.

By 1982 a new 14-kilometre four-lane section was completed between Wellington and Nanoose north of Nanaimo and a new bypass and bridge was built at 17th Street in Courtenay. Other sections of the Island Highway north of Nanaimo were four-laned and the first phase of a new four-lane Parksville–Qualicum Bypass was opened to traffic.

In the 1960's on *Highway 3* the first major obstacle was overcome when the Christina Lake to Kinnaird section was opened in October 1962. This 74-kilometre highway replaced the old Cascade route, a mountain gravel road, and its alternative, a 118-kilometre trip through the United States via Kettle Falls.

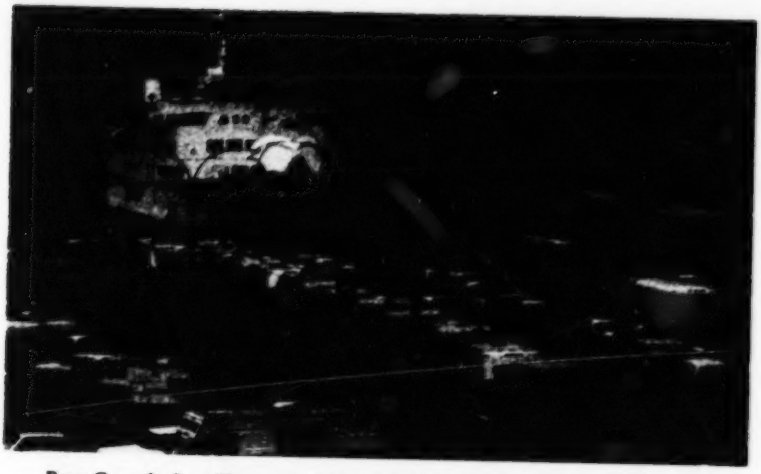
Other work on *Highway 3* has included improvements to the *Hope-Princeton Highway,* widened and paved over most of its length, with third lanes installed on long grades. In 1965 the new *Richter Pass route* from Keremeos to Oliver was opened, shortening the trip through Kaleden and Okanagan Falls by 32 kilometres. Other sections of *Highway 3* reconstructed were Greenwood to Grand Forks, Kitchener to Cranbrook, and several sections between Cranbrook and the Alberta boundary at Crowsnest Pass.

The *Castlegar-Nelson Highway 3A* was completely rebuilt. A new route from Castlegar to Thrums, including bridges across the Columbia and Kootenay Rivers, is completed. This revision bypasses the *Castlegar Ferry.*

In 1962, the *Vancouver-Blaine Freeway* (then called Deas Tunnel Throughway) from Oak Street Bridge to the United States border was officially opened. This is a four-lane, 40-kilometre divided freeway, including the *Massey Tunnel* itself (then called the Deas Tunnel). Total cost was about $57,000,000.

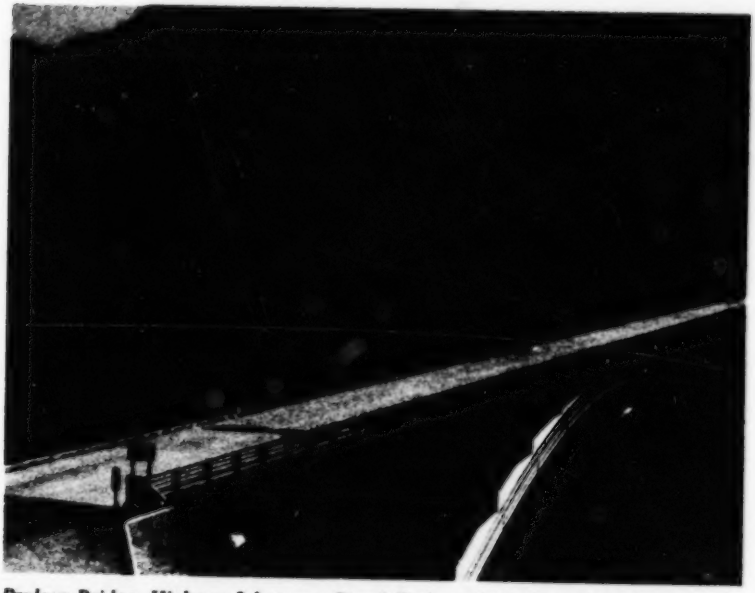
The new access to Simon Fraser University in Burnaby totals 8.8 kilometres and includes 5 kilometres of reinforced-concrete pavement, of which 3 kilometres were four lanes.

British Columbia's convoluted landscape and numerous waterways make it bridge country and there are more than 2,500 crossings in the highway system.

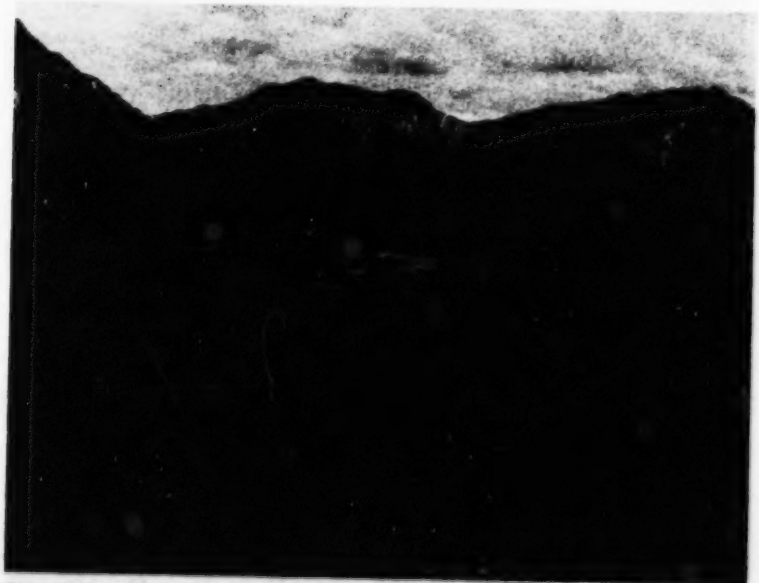


Bear Cove dock on Vancouver Island near Port Hardy, southern terminal of British Columbia Ferries Prince Rupert run.

Section of Highway 19 between Campbell River and Port Hardy on Vancouver Island completed in 1978.



Paulson Bridge, Highway 3 between Grand Forks and Castlegar. Crossings of deep canyons are unavoidable in British Columbia's highway system.



Beautiful dry-belt section, British Columbia interior region is this Richter Pass section of Highway 3 between Keremeos and Osoyoos.

Built to full freeway standard over the lowlands of the Fraser River delta south of Vancouver this is the Vancouver-Blaine Freeway, Route 99.

In the past 30 years the Ministry has built some 1,025 bridges of modern design, most of them steel and concrete structures and many over 300 metres long. On *Highway 1* alone the Ministry built, among others, the 300-metre *Columbia River Bridge* at Revelstoke, the 488-metre *Alexandra Bridge* in the Fraser Canyon, the 213-metre *Nine Mile Canyon Bridge* standing 92 metres above the river, and the 137-metre *Spuzzum Creek Bridge*.

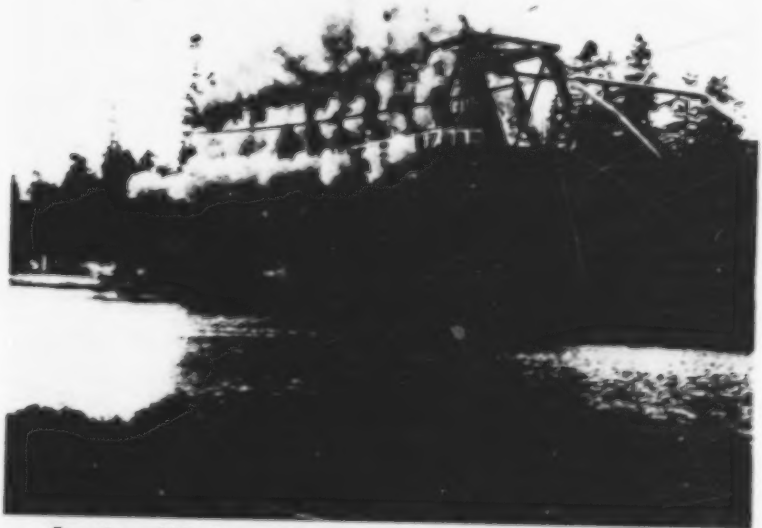
The spectacular *Port Mann Bridge* is a $25,000,000 (in 1964 dollars) structure with an over-all length of 2 104 metres — the world's longest high-level, stiffened, tied-arch bridge, the longest in the world with an orthotropic deck, and the first in North America to have an orthotropic plate deck. The cost today would be over $100,000,000.

Modern standards of highway construction demand a minimum degree of curve, good grades and adequate width. To achieve these standards in mountainous country, engineers have to solve some intricate problems.

Shot of Port Mann Bridge over the Fraser River on Highway 1, during construction. Structure is 2 100 metres long and 45 metres above high water.

Section of Trans-Canada Highway along the Thompson River swings out on high fill in order to maintain alignment and overpass the railway.

Beautiful Columbia River Bridge at Castlegar is one of several innovative designs used on British Columbia's highway system. Bridge is 336 metres long and 60 metres high.



Sometimes old bridges must be destroyed to make way for new ones. This well-used Howe Truss met a violent end at Sooke on Vancouver Island after replacement by a new steel and concrete structure upstream.

Use of the single-column pier is shown on the design of this highway bridge over the Thompson River near Spences Bridge. Angled across the river to maintain the 90 km/h alignment, the bridge is on Highway 1, 304 km east of Vancouver.

Unique local bridge near New Hazelton and Highway 16 is this suspension span over the Hagwilget Canyon.

The *Fraser Canyon* section of *Highway 1* north of Yale, as mentioned earlier, includes seven highway tunnels up to 640 metres long. Cut through solid rock bluffs, the tunnels have concrete-lined arch roofs and 8.15-metre-wide roadway surfaces plus sidewalks and lighting. Where the old road went around such obstacles, the new one must go through them to meet the required standard.

Similarly, between Lytton and Spences Bridge, maintenance of a reasonable standard presented another problem. The old road was sandwiched in between the railway and the river. In order to widen it to proper specifications, contractors had to move out into the river by the use of retaining-walls. In the 22-kilometre section from Tank Hill to Spences Bridge there is some 27 900 square metres of steel-bin wall and 26 740 cubic metres of concrete. This runs for about 1 372 metres and varies in height up to 9.75 metres, and in another section 1 470 metres of retaining-wall is required in a long curve of the river. About 19 100 cubic metres of concrete were required for this section.

Six of the largest bridge crossings were built originally for the British Columbia Toll Highways and Bridges Authority, a Provincial Government agency long since dissolved. These structures are now administered by the Ministry of Transportation and Highways and have not had tolls on them for 20 years. Among them is the four-laned, 640-metre tunnel under the Fraser River at Deas Island connecting Vancouver via Lulu Island with a new outlet to the United States border. Total length with approaches is 2 440 metres.

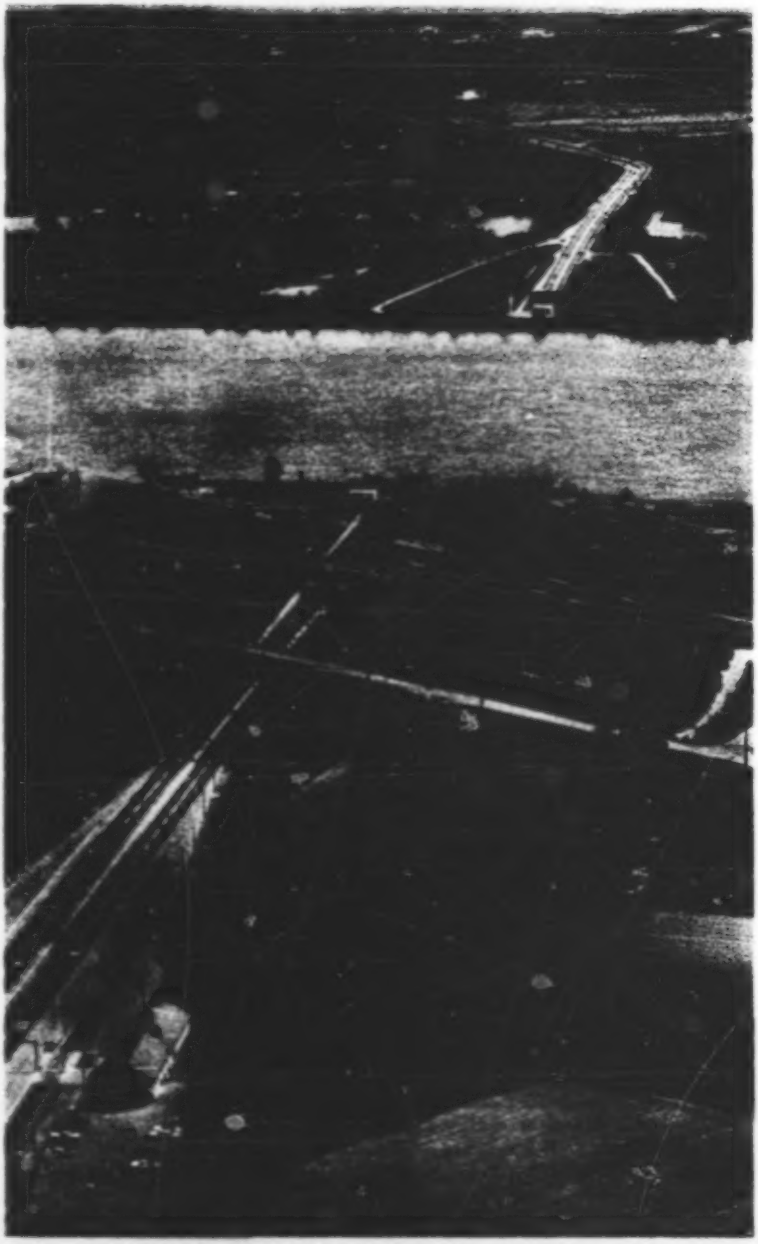
This tunnel was the first of its kind in the North American continent and among the first to use the method of construction in which concrete sections were built in a drydock, floated into position, sunk in a prepared trench, and then joined together. The tunnel is capable of handling 7,000 cars an hour. Costing around $25,000,000, it was opened in 1962 and by the end of 1984 it had carried nearly 300,000,000 vehicles. It contains 76 400 cubic metres of excavation and backfill plus 152,800 yards of bank and river protection.

The *Oak Street Bridge* was opened in June 1957. The structure is 1 840 metres long, with four lanes, and the cost was around $9,000,000. It connects Vancouver to Lulu and Sea Islands. When it first opened it was carrying an average daily traffic of about 18,000 cars. The figure in 1984 was about 77,900.

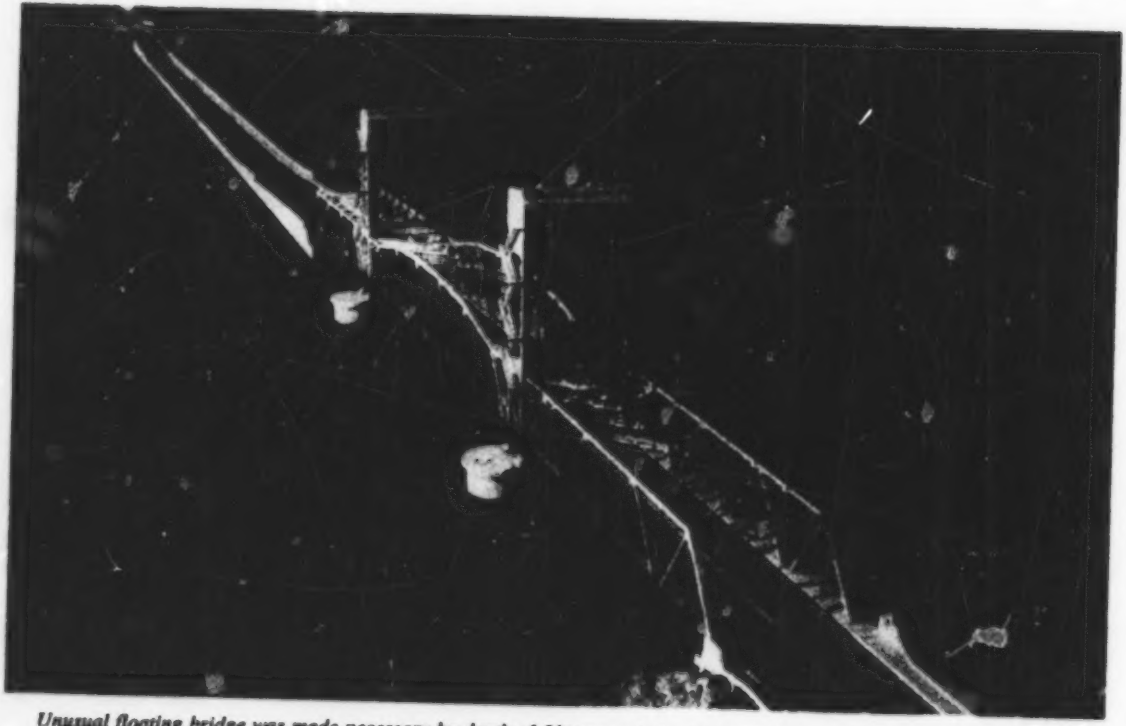
The *Agassiz-Rosedale Bridge* was opened in November 1956. A two-lane cantilever bridge across the Fraser River 96 kilometres east of Vancouver, it is 1 869 metres long and cost about $5,000,000.

The 1 293-metre, six-lane, *Second Narrows Bridge* across Burrard Inlet was completed early in 1959. Cost was about $25,000,000. Average daily traffic in the summer of 1984 was about 86,426 vehicles.

The 732-metre *Kelowna Bridge* across the Okanagan Lake between Westbank and Kelowna, a combination rock-fill causeway and floating pontoon bridge, cost about $10,000,000 and was completed in 1959.



Disappearing under the Fraser River, Highway 99, the Vancouver-Blaine Freeway crosses through the Massey Tunnel (formerly Deas Island Tunnel).



Unusual floating bridge was made necessary by depth of Okanagan Lake. Combination causeway, floating bridge, and liftspan join Kelowna and Westbank on Highway 97.

Opened late in 1957 was the 629-metre *Nelson Bridge*, a cantilever structure across the West Arm of Kootenay Lake at Nelson. Cost of this bridge was about $4,000,000.

The Toll Authority was set up in 1953 under its own Act for the purpose of "constructing, reconstructing, maintaining, acquiring, and operating toll highways and toll bridges in the Province". The use of the term "highways" in the Act was to cover the approaches to the new bridge. The Authority did not operate any toll highways. In addition to those bridges built for the Authority, it operated the Lions Gate Bridge in Vancouver, purchased from the Guinness interests in 1954, also now under the jurisdiction of the Ministry of Transportation and Highways since tolls were removed from all these structures.

Work was later completed on two large new crossings of the Fraser River in the Lower Mainland area. The new *Knight Street Bridge* was opened in January 1974 and the new *Mission Bridge* in July 1973.

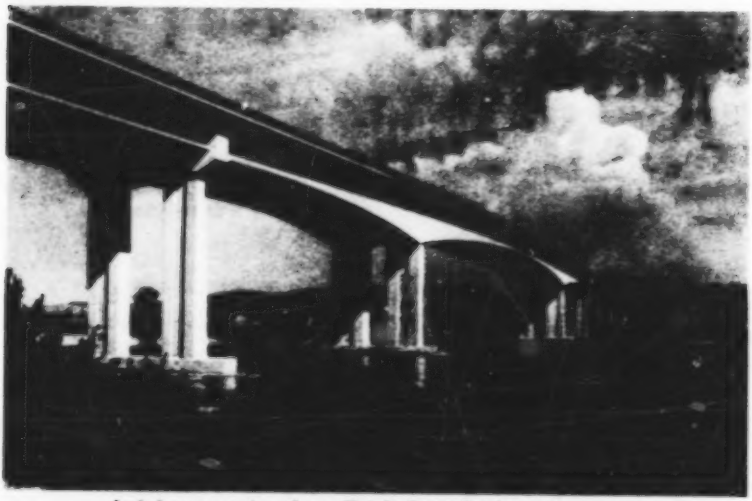
The *Knight Street Bridge* replacing the old Fraser Street Bridge is actually two separate bridges with a combined length of 1 436 metres. Travelling south from Vancouver, one crosses first a 238-metre prestressed-concrete span over the north branch of the Fraser River North Arm to Mitchell Island. This part of the crossing is six lanes with the two outside lanes joining into off-and-on loops for Mitchell Island and then onto a 1 198-metre prestressed-concrete structure over the south branch of the Fraser River North Arm from Mitchell Island to Lulu Island where it joins onto the existing road network.

The new *Mission Bridge* is 1 127 metres long, crossing the Fraser River southwest of the City of Mission and east of Matsqui Island. It is a four-lane structure with full navigational clearance for river traffic consisting of three orthotropic steel box-girder main spans, six 61-metre steel-plate girder flanking spans, and 12 prestressed-concrete girder approach spans, each 41 metres long. In 1984 a new $6,700,000 railway overhead at Mission became part of the Mission Bridge system.

In February 1980 the government announced the start of a major highway and bridge complex at Annacis Island and preliminary work began soon after. The system involves 30 kilometres of new multilane highway connecting New Westminster with Highway 99 and a 2 525-metre cable-stayed bridge and approach system over the Fraser River. Dredging, clearing, approach-fill work and soil-testing as well as preliminary bridge design work continued until 1984 when a $45,700,000 contract was awarded for the main span, a 465-metre structure which will be the longest of its type in the world. Completion is expected in 1986. Total cost of the complete bridge and road system including 14 kilometres of connecting roads is expected to be $275,000,000.

Among the many other new bridges completed in the past decade was the bridge and interchange over the Thompson River at Kamloops, the Foothills Boulevard at Prince George, the McPhee Bridge over St. Mary's River near Cranbrook and the famed Bridge of 23 Camels over the Fraser River at Lillooet replacing an old suspension bridge built in 1911. A number of bridges are being built along the Squamish Highway, and a new 400-metre structure has been built over the Fort Nelson River

on the Fort Simpson–Fort Nelson (Liard Highway) and a $6,800,000, 243-metre structure was completed over the Nass River at Greenville in northern British Columbia.

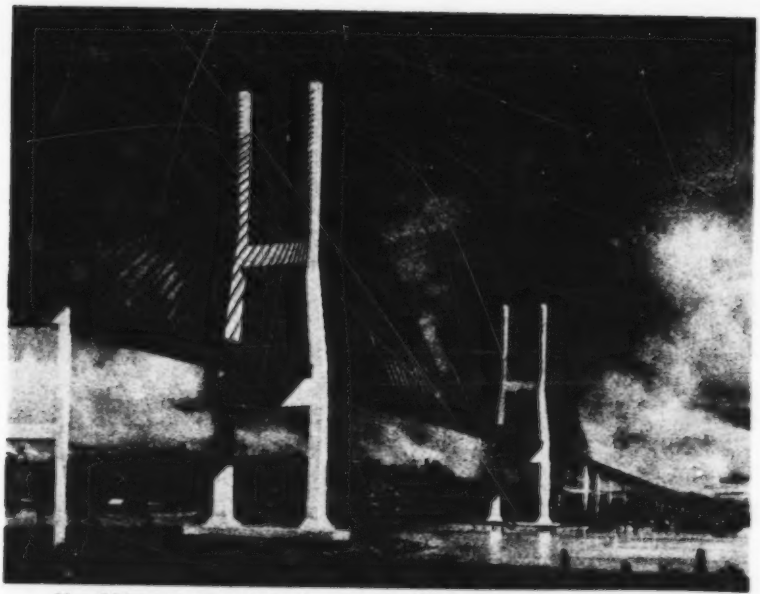


Artist's perspective of new Knight Street Bridge at Vancouver.

Downie Creek Bridge on Highway 23 — Revelstoke to Mica Creek — A beautiful combination of form and proportion.

Silver Tip Falls Bridge, Revelstoke-Mica Creek Highway. Over-all length is 190-metre, 8.5-metre-wide roadway.

New McPhee Bridge on Highway 95A 10 km north of Cranbrook, top, the Silver Tip Falls, centre, and the Downie Creek Bridge, both on Highway 23 north of Revelstoke are typical of the clean, new bridge design in concrete.



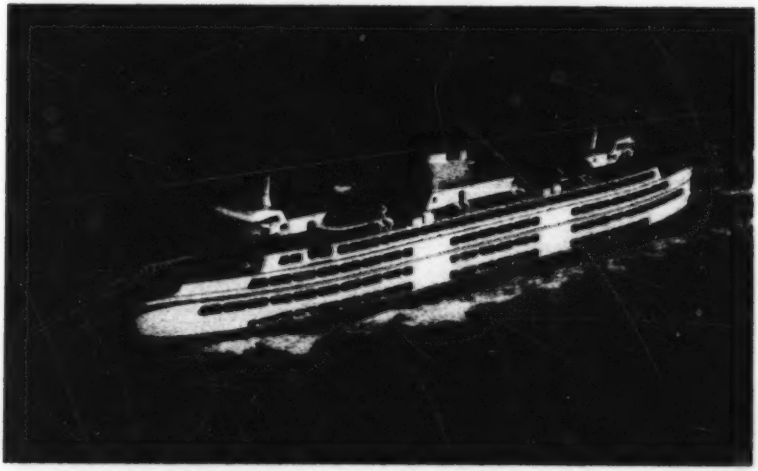
New 930-metre Annacis Bridge over the Fraser River. The 465-metre main span of the bridge will be the longest of its type in the world.

Section of the Annacis road system showing four-lane construction south of 64th Avenue in Delta.

British Columbia is a coastal province with about one-seventh of its total population on Vancouver Island, a number of offshore islands between Vancouver Island and the Mainland, and a great many lakes and rivers in its interior regions. It is, therefore, very much in the ferry business and operates some 60 ferries on 47 routes. These include 38 vessels and 32 routes, of which until October 5, 1985 were under the direct jurisdiction of the Ministry of Transportation and Highways with 25 ferries and 15 routes run by the B.C. Ferry Corporation, a Crown agency. The Minister of Transportation and Highways is the Minister responsible for the B.C. Ferry Corporation. The Ministry ferries carried 3,800,000 vehicles and 8,500,000 people in 1983. B.C. Ferry Corporation vessels carried another 4,462,000 vehicles and 12,275,000 passengers in the same year.

British Columbia not only builds and maintains highways but, as a coastal province with hundreds of lakes and rivers, it operates some 64 ferries on 49 routes, ranging from one-car cable ferries to 190-car vessels 130 metres long. This is one of the smaller coastal vessels, carrying 25 cars between Texada Island and Powell River on the Mainland.

The 25-car "Comox Queen" is dwarfed by 362-car "Queen of Cowichan" one of the latest additions to the B.C. Ferries fleet, shown in the aerial photo at Esquimalt Harbour near Victoria. The big, new 6 650-tonne, 140-metre long ferry was receiving finishing touches before going into service. One-quarter its length and one-tenth its tonnage, the "Comox Queen" was in for annual refit. By coincidence the Canadian Armed Forces minesweeper, left, is also named "Cowichan".



One of the larger British Columbia "super" ferries entering the terminal at Horseshoe Bay after run from Nanaimo on Vancouver Island.

However, in October 1985 the B.C. Ferry Corporation took over the Ministry coastal ferries, that is those operating between Vancouver Island and the offshore islands such as Denman, Gabriola and Quadra Island. This added 13 vessels, 10 ferry routes and 437 staff to the B.C. Ferries fleet. The Ministry retains those ferries operating in the interior of the Province on various lakes and rivers. In addition to the now enlarged Gulf Island operation B.C. Ferries runs 12 large ferries including new "super ferries" carrying 360 cars and 1,500 passengers, on two routes between Vancouver Island and the Lower Mainland, ferries on three routes involving Sechelt, Jervis Inlet and Bowen Island, one large ferry on a 408-kilometre route from Port Hardy to Prince Rupert, and another between Prince Rupert and the Queen Charlotte Islands.

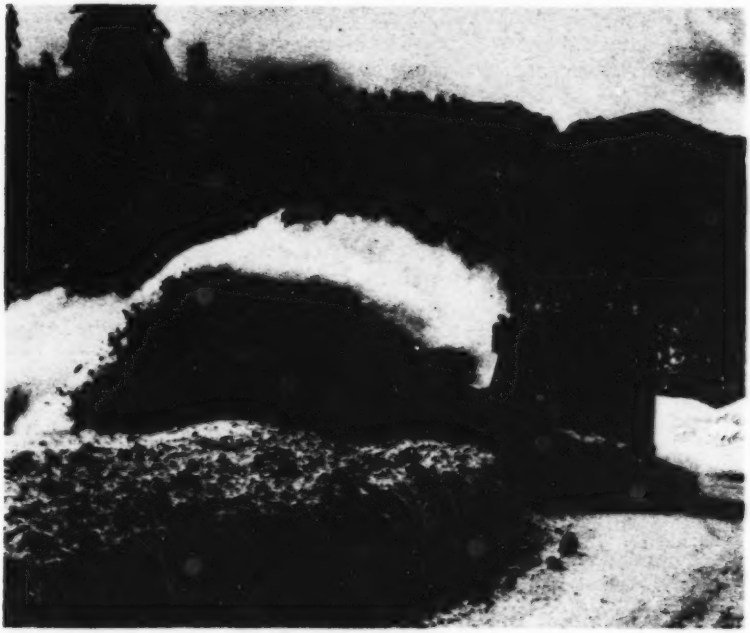
Growth of the B.C. Ferry Corporation operation is said to be almost unprecedented in peacetime shipping. In June 1960 there were two ships, two terminals, and 225 employees. By the end of 1983 the service had 25 vessels and nearly 2,300 permanent employees. Its 15 routes require 22 terminals. In 24 years the fleet has carried 172,063,000 passengers and about 62,618,000 vehicles.

The British Columbia Ministry of Transportation and Highways employs about 7,000 employees.

While the Transportation side deals with motor vehicle and motor carrier regulations and licensing, driver licensing, broader aspects of transportation policy and engineering inspection, as well as the operation of government air services and an airport assistance program, the Highways section of the Ministry is concerned with the survey, design, construction and maintenance of roads and bridges, and the design, construction and operation of ferries and ferry terminals.

One of the major responsibilities of the Ministry is the maintenance of over 40 000 kilometres of main and secondary roads during the winter season and depending on the weather conditions, the cost of snow removal and ice control can often be very high.

To carry out this program, about 1,800 underbody and front-mounted plows on trucks, 300 graders with wings and 250 loaders are employed on basic snow removal. Extreme conditions are handled by 30 rotary plows. For control of icing the Ministry uses 1,100 sanders. There is an ever-increasing demand for ice control, especially in coastal areas as traffic volumes increase.



The only one of its kind in the world was this turbine-powered blade snow plow shown here on the Salmo–Creston section of Route 3. Machine was built by Ministry of Highways mechanics who installed Pratt and Whitney ST6-A turbine engine. Though the unit weighed 40,000 pounds, the little 130-kilogram turbine could drive it up to seven per cent grade at 70 km/h while plowing snow! The machine is now out of service but other equipment has been developed because high-speed plowing is needed on some of the Province's mountain passes.

A radio communication system is in operation throughout the entire Province, and this system assists the snow removal program immeasureably. Approximately 3,500 vehicles are equipped with VHF mobile radios and there are about 125 mountain-top repeaters for range extension. There are about 250 base station radios located in Highways' garages, yards and offices. There are also about 1,500 portable radios used for special out-of-vehicle purposes. The mountain-top repeaters are inter-connected through a trunk system which allows any vehicular radio operator to communicate with any other vehicular or base radio in the Province. For control of this system, there are communications consoles located in or near each of the Ministry's Regional offices. The radio system improves maintenance efficiency during normal conditions and improves safety to the public and Highways personnel during emergency conditions.

The Ministry of Transportation and Highways is under the direction of the Minister of Transportation and Highways who is responsible to the Executive Council and the Legislature. Immediate supervision is under

the Deputy Minister who interprets policy to the Ministry and is also head of administration. For the Highway wing of the Ministry there are two Assistant Deputy Ministers, three executive Directors and complete technical and administrative complement in Victoria including design and survey, construction, bridge, paving, traffic, planning and geotechnical and materials branches.

The Province is separated into six regions, each with a Regional Director and support staff. The regions are made up of 38 Highway Districts each with a District Highway Manager, engineering staff, clerical staff, mechanical staff, a fleet of road equipment and headquarters base. The district maintains the roads, bridges, ferries, signs and signals on all the provincial roads in its area. Duties include snowplowing and sanding, an important part of maintenance because of the severe winter conditions in some parts of the Province.

British Columbia is a vast and rugged land with striking variations of climate, soil conditions, geological formations, topographical features and weather. For the highway engineer it offers within its borders almost every engineering problem found in other parts of the world — and a few found nowhere else. Dense rain forests on the Pacific Coast, arid hills in the southern interior dry-belt regions, high mountains, deep canyons, swift rivers, innumerable lakes and coastal inlets, and endless variety of soil and rock conditions, 3 800 mm annual rainfalls and 1 500 mm snowfalls — all these features and many others can be found somewhere in British Columbia's 945 000 square kilometres. Roadbuilding, maintenance of a good highway system and regulation of people and equipment using it is a challenging, arduous and formidable task.

C. Brew 1863

J. W. Trutch 1864–1871

B. W. Pearse 1871

H. Holbrook 1871

G. A. Walkem 1872, 1878–1882

R. Beaven 1872–1876, 1882

W. Smithe 1883–1887

F. G. Vernon 1876–1878, 1887–1895

G. B. Martin 1895–1898

C. A. Semlin 1898

F. L. Carter-Cotton 1899

J. S. Yates 1900

R. McBride 1903

R. F. Green 1903–1906

R. G. Tatlow 1906

F. J. Fulton 1907–1908

T. Taylor 1908–1914

C. E. Tisdall 1914–1915

J. H. King 1915–1921

W. H. Sutherland 1921–1927

H. S. Longley 1927–1929

R. W. Brake 1929–1932

R. H. Pooley 1932–1933

R. M. MacPherson 1933–1939

C. S. Leary 1939–1941

H. Anscomb 1941–1945

E. C. Carson 1945–1952

P. A. Gagland 1952–1968

W. A. C. Bennett 1968

W. D. Black 1968–1972

R. M. Strachan 1972–1973

G. R. Lea 1973–1975

A. V. Fraser 1975–